

Development Services Department



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RESIDENTIAL PHOTOVOLTAIC TEMPLATE ELECTRICAL ELEMENT

APPLICABILITY

- ◆ Residential photovoltaic systems.
- ◆ Simple systems consisting of photovoltaic arrays, inverter, AC grid-tie.

FUNDAMENTAL REQUIREMENTS

- ◆ Minimum font size of 1/8-inch (all upper case). Reference 2006 International Building Code, 106.1.1.
- ◆ Standardized 11" X 17" sheets.
- ◆ Design per National Electrical Code and local amendments, with special emphasis on Article 690.
- ◆ Letter from utility company acknowledging grid-tie PV system, unless the project SunShare
- ◆ PV Panel Cut Sheets with clear identification of exact equipment selected, clear identification of all design-pertinent information (highlight rated power, rated voltage/voltage at maximum power, rated current/current at maximum power, open circuit voltage, short circuit current, series fuse rating, maximum system voltage), and documentation of listing of equipment
- ◆ Inverter Cut Sheets with clear identification of exact equipment selected, clear identification of all design-pertinent information (highlight nominal output power, input voltage range, maximum input voltage, maximum input current, nominal AC voltage, operating AC voltage range, maximum output current, overcurrent protection, ground fault protection, zero feedback documentation, positive/negative grounding requirements (if applicable), and documentation of listing of equipment
- ◆ Cut sheets for all manufactured devices

TABLE

◆ DC System size

◆ Panels

- Panel Manufacturer, Model Number, and Maximum Power
- Voltage at maximum power
- Current at maximum power
- Open-circuit voltage
- Short-circuit current
- Number of panels

◆ Array Specification

- Number of Panels in Series
- Number of Series Arrays
- Voltage at maximum power for each Series Array
- Current at maximum power for each Series Array
- Open-circuit voltage for each Series Array
- Short-circuit current for each Series Array

◆ System Specification

- Voltage at maximum power for entire System
- Current at maximum power for entire System
- Open-circuit voltage for entire System
- Short-circuit current for entire System

◆ Inverter

- Inverter Manufacturer and Model Number
- Total Number of Inverters
- Input Voltage Range VDC
- Input Current, Maximum
- Nominal Output Voltage
- Output Voltage Range
- Nominal Output Power
- Output Power, Maximum
- Output Current, Maximum
- Output Overcurrent Protection
- Utility Backfeed Current, Maximum

CALCULATIONS

- ◆ Maximum Photovoltaic System Voltage (Reference NEC 690.7 and Table 690.7)
- ◆ Overcurrent Protective Device and Conductor Sizing for Photovoltaic Source Circuits and Module Interconnection Conductors (Reference NEC 690.8 (A) (1), (B) (1), and (D))
- ◆ Temperature Derating for Conductors (NEC Table 310.16)
- ◆ Voltage Drop (not Code-required for PV at this time, but may be desirable)

KEY TO SYMBOLS

On each sheet as pertinent to that sheet, and no “not used” symbols.

EQUIPMENT LAYOUT

- ◆ Project address
- ◆ North arrow
- ◆ Outline of building/structure pertinent to PV installation
- ◆ Location of all new and existing equipment
- ◆ Please omit property lines or any dimensioning to such

LINE DIAGRAM

- ◆ Panels with positive and negative indicated. Number of panels shall be clear.
- ◆ Any connecting junction boxes intended for the installation.
- ◆ DC disconnect enclosure, if applicable. Specify DC fusing, if applicable.
- ◆ Inverter with positive and negative inputs and 2-pole outputs.
- ◆ Solar Meter.
- ◆ Surge arrestors, if any.
- ◆ Owner's AC Panel. Show voltage, phase, and current rating of panel, and current rating of both the Main Circuit Breaker from the utility side and current rating of any circuit breakers used to interconnect the inverter output with the electrical grid. (Reference NEC 690.64 (B)).
- ◆ Premises Grounding Electrode System, and any supplementary grounding electrodes.
- ◆ All conductors, positive, negative, AC phase conductors, equipment grounding conductor, grounding electrode conductor. Specify conduit and conductor size and type.

NOTES/SPECIFICATIONS

- ◆ Provide the exact wording and location for the marking required by NEC 690.14 (C) (2).
- ◆ Provide the exact wording and location for the warning sign required by NEC 690.17.
- ◆ Provide the exact wording and location for the marking required by NEC 690.53.
- ◆ Provide the exact wording and locations for any plaques which may be required by NEC 690.56 (B).
- ◆ Specify that any backfed circuit breaker shall be installed in compliance with NEC 690.64 (B) (5).
- ◆ Specify that the Installer shall comply with all requirements of NEC 2005 and any applicable local amendments.
- ◆ Specify that the module interconnection connectors shall be marked for positive and negative polarity. Reference NEC 690.33 (A).
- ◆ Specify that the module interconnection connectors shall be of the locking or latching type. Reference NEC 690.33 (C).
- ◆ Specify that the module interconnection connectors either be capable of interrupting the circuit current without danger to the operator, or marked: “Do Not Open Under Load.” (Reference NEC 690.33 (E), and Handbook commentary.)
- ◆ Specify that the connection of a panel or module be arranged so that the removal of a panel or module from a photovoltaic source circuit does not interrupt a grounded conductor to another photovoltaic source circuit. (Reference NEC 690.4 (C)).
- ◆ Specify that all equipment shall be listed by an Independent Testing Agency.
- ◆ Specify that the Grounding Electrode Conductor be continuous. (Reference NEC 250.64 (C), 250.160.

RESIDENTIAL PHOTOVOLTAIC DOCUMENTATION STRUCTURAL SUMMARY

Supporting Structure:

Show location and identify each panel grouping on a System Layout.

Identify the building type and roof surface with any drainage devices (number and size).

Provide the roof slope and structural type/size (manufactured truss or field assembled materials).

For porch or carport structures identify component dimensions, spacing and spans. Beams require dimensions, span and tributary information (distance to walls or parallel beams and presence of any ceiling). Identify any ceiling material and lateral bracing.

Loading Distribution:

Show the connecting system and panel grouping weight, mounting angle and loading area.

Identify the number of Truss/Rafter members below the panel grouping for determining load distribution (200 pound maximum for each truss).

Provide a plan for any additional structural support.

Uplift Connections:

Provide the required uplift (pounds) from the panel grouping area and maximum wind load.

Identify the pullout strength per connector and show the required number of connectors.

Show the selected connector type, size and length.

RESIDENTIAL PHOTOVOLTAIC TEMPLATE STRUCTURAL SUMMARY

Provide construction documentation for each panel grouping shown on the System Layout

Panel grouping identification # _____

Supporting Structure:

Building Type:

Original Dwelling _____; Dwelling Addition _____; Carport/Porch _____; Accessory _____

Roof Surface:

Tile _____; Shingle _____; B/U _____;

Drainage System _____

Roof slope _____

Manufactured Truss spacing _____ IN,

(OR) Rafter: type _____; dimension _____x_____ IN; spacing _____ IN; span _____ FT

(if post/beam structure)

Beam: type _____; dimension _____x_____ IN; span _____ FT; tributary _____ FT

Ceiling: none _____, gypsum _____ or other _____

Lateral bracing: _____

Loading Distribution:

Attachment rail type _____

Panel grouping weight _____ LB; area _____ SF; angle _____ degrees; load _____ PSF

Number of Truss/Rafter members below each panel grouping _____

Uplift Connections:

Panel grouping area _____ SF (X) maximum wind load _____ PSF (=) total load _____ LB

Required pullout strength/connector _____ LB

Number of connectors for each panel grouping _____

Connector type, size and length _____, _____ x _____ IN